Math 220 (6pm section) - Exam 2

Name: _____

ID: _____

Score: _____ /100

1. Determine the derivatives of the following functions. (5 points each)

   (a) $f(x) = \tan^{-1}(e^x)$

   (b) $\ln(x)^{\ln(x)}$

   (c) $e^{e^{e^x}}$

   (d) $x \sinh(\ln(x))$

2. Evaluate so that your answer is a fraction. (5 points each)

(a) $\ln(\cosh(2) - \sinh(2)) =$

(b) $\cot(\cos^{-1}(\frac{4}{5})) =$

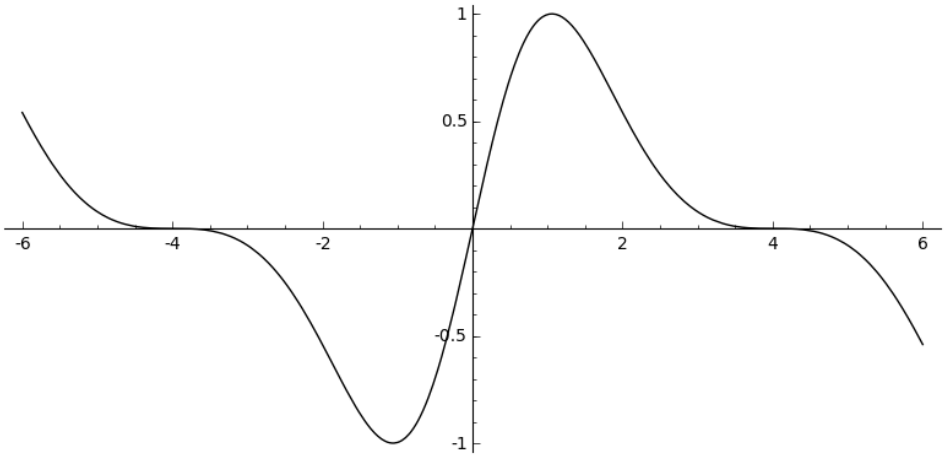
3. Determine each limit. Show your work. (6 points each)

(a) $\lim_{x \to 0^+} x \ln(x)$

(b) $\lim_{x \to 0} \cosh(x)^{1/x^2}$

4. Find the point on the line $y = 2x - 5$ closest to the origin. (12 points)

5. Shown below is the graph of the derivative $f'(x)$ of a function $f(x)$ ($f(x)$ is NOT shown).



Within the interval shown, answer the following questions about $f(x)$ (NOT $f'(x)$). Briefly explain your reasoning, but feel free to round numbers to the nearest integer. (2 points each)

(a) Where is $f(x)$ increasing?

(b) Where is $f(x)$ decreasing?

(c) What are the local maxima of $f(x)$, and how do you know they are maxima?

(d) What are the local minima of $f(x)$, and how do you know they are minima?

(e) Where is $f(x)$ concave up?

(f) Where is $f(x)$ concave down?

(g) Where are the inflection points of $f(x)$?

6. Let $f(x) = x^{2/3}(x^2 - 16)$. Find the minimum and maximum values of $f(x)$ on the interval $[-3, 3]$. Show your work. (12 points)

7. A sample of plutonium initially has a mass of $128g$, but after 30 years there is only $32g$ remaining. How much will be left after 75 years? Show your work. (8 points)

8. Suppose that the functions $f(x)$ and $g(x)$ are differentiable, with values given in the following table.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	-1	3	2	-2
1	0	2	0	-3
2	1	1/2	-1	-1/2
3	3	1	-2	-1

Suppose that $h(x) = g(f(x))$. What is $(h^{-1})'(0)$? Show your work. (12 points)